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Standard Guide for Testing Cleaning Performance of Hand Dishwashing Detergents¹

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1. Scope

1.1 This guide covers cleaning performance in hand dishwash applications.

1.2 This guide provides guidelines for several techniques of measuring the cleaning performance of light-duty hand dishwashing detergents in the presence of artificially applied test soils and/or standardized Ready To Use (RTU) test materials. It is intended as a laboratory screening test to aid in the formulation of products, for quality control and as a basis between the formulator and supplier in standardizing specific products' cleaning performance.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Summary of Guide

2.1 Soiled substrates and/or standardized RTU test materials are washed using a TQC Scrub ability tester by presoaking the soils in solutions of hand dishwashing detergents under standardized conditions. The soil removal efficacy of each hand dishwashing detergent is expressed as a percentage Soil Removal Index (SRI %) compared to a defined mid-tier Reference Hand Dishwashing Detergent.

3. Significance and Use

3.1 The guide is suitable for ranking of hand dishwashing products, using particular food soil or combination of soils with objective color measurement ranking of performance.

3.2 The relative wash performance ranking of hand dishwashing detergent products will vary depending on the type of food soils and/or standardized ready to use test materials used in the test. Therefore, a selection of the standard food soil or ready to use test materials to be used in a test shall be made by agreement between the interested parties on the basis of experience.

3.3 This laboratory screening guide includes flexibility in test methods to allow the end-user to decide which method suits best for its application area. To reach an acceptable level of accuracy dedicated equipment and reliable test materials should be used. It should be recognized that differences in specific test methods may result in different cleaning results, and such results must be evaluated with caution.

4. Recommended Conditions

4.1 **Water Hardness**—If only one test is to be made, hard water (8.5 °DH or 150 ppm, about 9 grains per gallon (gpg)) is suggested. To produce a more complete picture of product performance, test at two or three additional hardness levels: soft water (2.0 °DH or 35 ppm, 2 gpg); moderately hard water (5.5 °DH or 100 ppm, 6 gpg); or very hard water (15 °DH or 260 ppm, 15 gpg).

4.1.1 **Calcium/Magnesium Ratio (as CaCO₃)**—It is suggested that this ratio should be adjusted for different water hardness as follows:

Water Hardness Range, Calcium/Magnesium ppm (gpg)	Ratio
0 to 60 (0 to 3.5)	4:1
61 to 120 (3.6 to 7.0)	3:1
121 and over (7.1 and over)	2:1

4.2 **Water Temperature**—The recommended water temperature during the test should be 47 °C (117 °F).

5. Materials and Devices

5.1 **Tiles**—Melamine, plastic, technical porcelain, stainless steel, all 100 mm by 120 mm (3.9 in. by 4.7 in.).

5.2 **TQC Weights**—100 g, 200 g, 400 g (or combinations of).

5.3 **Disposables**—Synthetic sponges 90 mm by 46 mm by 30 mm (3.5 in. by 1.8 in. by 1.2 in.).

5.4 **Devices**—TQC Sheen scrub ability tester (X1.1).

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5.5 All materials and devices are available at supplier(s).²

6. Standard Soils

6.1 Four soils, representative of those commonly used for hand dishwashing tests, are described in **X1.2**. Standardized RTU test materials with specific soil types can be used as well, see **X1.2** and are available at supplier.²

7. Preparation of Soiled Tiles

7.1 Weigh each tile, tare, and then add soil.

7.2 Transfer Soil A or B most readily, with a small spatula. Scrape all soil from the spatula on the full surface of the tile. Soil C, a liquid at 42 °C (108 °F), can be added from a small spoon or by using an automatic pipet syringe set to deliver 2.0 g.

7.3 For Soil D use a press-down cream dispenser with adjustable plunger to deliver 0.66 g ± 0.03 g of soil to each tile.

7.4 Use one finger to spread the soil over the surface of the tile. Disposable gloves are recommended for this procedure. Soiled tiles are placed on a metal plate.

7.5 Wash Soils A, B, or D the same day as soiling. Test wash Soil C the day after soiling.

7.6 Keep soil well mixed by frequent stirring and keep soil covered. Do not use excess soil or soiled tiles beyond the time schedule, as noted.

8. Preparation of Dishwash Solution

8.1 *Dishwash Solution*—The standard concentration is 15 % detergent solution. The standard temperature is 47 °C (117 °F). Other “as is” or solids concentrations can be used in comparison testing.

8.1.1 Prepare 2 L of test water at desired hardness and temperature and place in beaker.

9. Washing Procedure

9.1 Three alternative methods for washing the soiled tiles or the standardized RTU test materials are explained in the following:

9.1.1 *SOAK Method—Soak Tile in Detergent Solution*—Place a maximum of 4 soiled tiles or standardized RTU test materials in beaker by securing the tiles with a peg and iron wire. Soak for 10 minutes, no agitation. Carefully remove the tiles and place them in the TQC scrub ability tester. Start the desired scrub protocol, examples are given in **Table X1.1**.

9.1.2 *ABS Method—Absorption of Detergent in Sponge*—Pour 10 mL of the 15 % detergent solution in a petri dish. Let the sponge soak in the detergent solution. Wait until sponge absorbed all the detergent solution. Place the sponge with the absorbed detergent solution in the holder of the TQC scrub ability tester. Place the soiled tiles or standardized RTU test materials in the scrub ability tester. Start the desired scrub protocol, examples are given in **Table X1.1**.

9.1.3 *SOAK Method*—Soak method according to No-zyymes protocol.

10. Cleaning Procedure

10.1 After each scrub test, dispose the sponges and clean the TQC holders and TQC washbasins with hot tap water and dry before start the next run. The soiled tiles that have been washed after the test should be dried and kept apart for color measurement and/or visual inspection.

11. Reference Hand Dishwashing Detergent

11.1 Periodically, and specifically when using any new components in the preparation of a soil or when evaluating a new set of samples, it is prudent to test a known reference hand dishwashing detergent to permit comparison with previous data. This reference mix should show same cleaning performance within the normal variation limits. The recipe to prepare the Reference Hand Dishwashing Detergent is given in **Table X1.2**. The European Reference Hand Dishwashing Detergent can also be ordered from supplier.²

12. Arrangement of Tests

12.1 Since the absolute level of results, that is, Soil Removal Index percentage (SRI %), may be different for different operators and on different days, these possible effects should be allowed for by:

12.1.1 Testing each product the same number of times by each operator.

12.1.2 Testing products on a comparative basis.

12.1.3 Conducting at least four replicate tests.

12.2 The products should be tested until a suitable and specified statistically determined confidence interval is reached between the appropriate comparisons.

12.3 Wash performance of each hand dishwash detergent should be measured via a reflectance photometer or alternative measuring device.

13. Data Evaluation

13.1 The test conditions, such as, water hardness, product concentration, temperature, test method, and method of data analysis, should be specified.

13.2 Calculate the average cleaning performance by each product (including that of the reference product when applicable), over the several replicate tests. Express the performance of the test product(s) and the reference product as percentage of Soil Removal Index (SRI %):

$$\text{SRI \%} = \frac{Y_w - Y_s}{Y_u - Y_s} \times 100 \% \quad (1)$$

where:

Y_u = the Y-value of the substrate before any soil is applied
 Y_s = the Y-value of the soiled substrate or standardized RTU test material

Y_w = the Y-value of the washed soiled tile or standardized test material

13.3 Differences in performance may also be expressed as a subjective score ranking, as long as a score is assigned

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